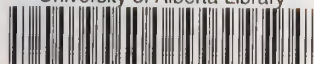


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THE UNIVERSITY OF ALBERTA

RELATIONSHIP BETWEEN SCORES OBTAINED  
BY BENNETT AND BERNREUTER SYSTEMS  
OF SCORING BERNREUTER INVENTORY

A DISSERTATION SUBMITTED  
TO THE COMMITTEE ON GRADUATE STUDIES  
IN PARTIAL FULFILMENT OF THE DEGREE OF  
MASTER OF EDUCATION

BY  
VINCENT A. MacNEIL

May, 1950



Thesis

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## CHAPTER I

### A

#### INTRODUCTION AND STATEMENT OF THE PROBLEM

The Bernreuter Personality Inventory has enjoyed since its introduction a considerable degree of popularity. It is attractive in format, simple, compact, comprehensive, and easily administered. It embodies the better elements of several earlier tests in the same field and yields scores on several aspects of personality. At the level of administration its principal defect has lain in the mechanics of scoring.

As it left the hands of its author, the Bernreuter Inventory was to be scored by means of four keys or masks. The method of weighted scores was to be employed. Item weightings ranged from +7 through zero to -7. The scoring process proved to be tedious, time-consuming, and difficult.

It is the purpose of this study to examine the claims made for a shorter or simplified scoring method, that proposed by G. K. Bennet, now president of the Psychological Corporation. This simplified scoring method has been validated against the longer method for a small population of adult women. The present study includes somewhat larger populations representing four groups, namely, adult men, adult women, college men, and college women.



B

HISTORY OF THE PROBLEM - BERNREUTER'S INVENTORY

In Bernreuter's Inventory four personality traits of social and psychiatric importance have been selected for measurement: Neurotic tendency, (B1-N); Self Sufficiency, (B2-S); Introversion - Extroversion, (B3-I) and Dominance - Submission, (B4-D).

The items appearing on the Inventory have been selected from each of four well-known tests dealing with the traits mentioned. These four tests, taken in order, are as follows:

1. Thurstone's Neurotic Tendency Inventory  
for B1-N;
2. Bernreuter's Self-Sufficiency Test for  
B2-S;
3. Laird's Introversion Test for B3-I;
4. Allport's Ascendance - Submission  
Reaction Test for B4-D.

The correlations obtained between the Inventory and these earlier tests are reported as follows: <sup>1</sup>

B1-N . . . . .	1.00
B2-S . . . . .	1.00
B3-I . . . . .	0.99
B4-D . . . . .	(Not Reported)
(a) for men . . . . .	1.00
(b) for women . . . . .	0.99

---

<sup>1</sup>Bernreuter, R.G.: Manual for the Personality Inventory, page 4. Stanford University Press.

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Bernreuter's Inventory, by choice, gradation and organization of its items, aimed at testing all these four traits by means of a single instrument.

The Inventory is of the questionnaire type, consisting of one hundred twenty-five items, the sources of which have already been named. For each trait appearing on the Inventory a separate scoring key has been provided. The paper has to be checked four times, once for each of the four original B-Scales, the responses being weighted with numerical values ranging from -7 to +7. The Algebraic sum of these values gives the raw score for each trait. After the raw scores have been computed percentile ranks may be obtained, some directly, others by interpolation, from percentile charts compiled for each age-sex group. Consideration of the scoring method just outlined will give an idea of the complexity of the process. The routine of securing the raw scores is tedious, time-consuming and laborious, requiring at least twenty-five minutes to complete the checking of one paper. Owing to the use of positive and negative numbers in finding the raw scores, the chances of making errors in computation, even when a machine is used, are high, and even higher when all the work is done by hand.

This complex scoring method very effectively discouraged the wide-spread use of the inventory, especially where large numbers of candidates were involved.





A first step in the simplification of scoring was made in 1935 by J. C. Flanagan. By the Hotelling Method of Principal Components, Flanagan<sup>1</sup> showed that of the total variance of the Bernreuter factors 96 per cent might be represented by only two factors. These were designated F1-C and F2-S. Scoring scales were constructed for these and regression equations were worked out for the derivation of scores for the four original Bernreuter factors. This step considerably reduced the burden of scoring but the two scales were still weighted as before and the regression equations constituted a minor hazard in the transmutation of scores. For 100 eleventh-grade boys in the high schools of the suburban Boston area, Flanagan determined coefficients of correlation of the following orders as for the two scoring methods, viz.,

B1-N	Neurotic Tendency	.970
B2-S	Self-Sufficiency	.867
B3-I	Introversion	.954
B4-D	Dominance-Submission	.867

---

Flanagan<sup>1</sup> : Factor Analysis in the Study of Personality.  
103 pages photolith, Stanford University  
Press, 1935.



## CHAPTER II

### BENNETT'S REVISION PROCEDURE

To facilitate the use of Bernreuter's Inventory there was need of a simpler scoring method. This was provided by George H. Bennett, (1935).

Using the Flanagan F-Scales, which, as already stated, showed a high correlation with the original Bernreuter B-Scales, Bennett evolved simple scoring keys for the Inventory. He reweighted the Flanagan F-Scales obtaining two scales whose intercorrelation was extremely low (-0.015), but whose correlations with the original Flanagan scales were high:

1. Bennett F1-C and Flanagan F1-C . . . . . 0.971
2. Bennett F2-S and Flanagan F2-S . . . . . 0.938

Using these reweighted F-scales, Bennett obtained regression equations involving Bernreuter's B-scales. He prepared percentile charts from which ranks for the B-scales could be read without interpolation. These percentile ratings showed high correlations with the percentile ranks obtained by Bernreuter's original method.

They are as follows:

1. B1-N . . . . . 0.965
2. B2-S . . . . . 0.893
3. B3-I . . . . . 0.934
4. B4-D . . . . . 0.924



The Bennett scoring keys for the Inventory are of the "window" type. As there are only two and as the numbers used in evaluating the responses to the items range only from zero to plus two, the ease and rapidity with which the raw scores may be computed is obvious. The transmutation of raw scores to percentile scores is also the work of a moment as the latter can be read from a prepared percentile chart. (Bennett: Simplified Scoring Method for Bernreuter's Inventory. Psychological Testing - Mursell).

As indicated in Chapter I, Bennett's validation of his simplified scoring method was based only upon test scores for adult women. The purpose of this study is to check the Bennett findings for adult women and to broaden the basis for comparison by including test scores from college women, college men, and adult men.



### CHAPTER III

#### EXPERIMENTAL DESIGN

In order to establish the relationship between the results obtained by the Bennett simplified scoring method and those obtained by Bernreuter's original method, data secured by testing four groups of subjects were used. The groups were as follows:

1. College men . . . . . 35 cases
2. Adult men . . . . . 46 cases
3. College women . . . . . 65 cases
4. Adult women . . . . . 58 cases

making in all a total of two hundred four cases. The college men and women were students of the University of Alberta, chiefly from the Faculty of Education. The adult men and women were, in the main, technicians and other workers in radio stations in both Eastern and Western Canada.

Each paper of each of these groups was scored according to the Bernreuter method; the raw scores obtained were transmuted to percentile scores, and both raw and percentile scores were recorded on the front page of the inventory forms, just beneath the "Bernreuter" percentiles. Each paper was again scored, this time utilizing the Bennett simplified scoring method. Correlations were run for each trait under study, using "X" to designate the "Bernreuter" scores and "Y" the "Bennett" scores. In all, twenty-five correlation coefficients were obtained, a tabulation of which is shown in the following chapter.





In all computations ungrouped data were used, largely in the interests of greater precision. The Pearson product-moment method was employed.



## CHAPTER IV

### PRESENTATION OF ANALYSIS OF DATA

In Table I are displayed the coefficients of correlation obtained in the comparison of scores on the Bernreuter Personality Inventory derived first from the original scoring method and second from the simplified scoring method.

TABLE I

Group	N	B1-M	B2-S	B3-I	B4-D	All Traits
College Men	35	0.976	0.905	0.957	0.891	0.932
Adult Men	46	0.945	0.924	0.897	0.878	0.911
College Women	65	0.994	0.902	0.907	0.929	0.933
Adult Women	58	0.956	0.938	0.907	0.883	
Total All Traits of all Groups	816					0.921

Taking these figures at their face value, it appears that a close correspondence exists between the two sets of scores. The corresponding figure drawn from a parallel study by Mr. Kostash<sup>1</sup> are shown in his Table II, page 10.

---

Kostash<sup>1</sup>: Relationship Between Scores Obtained By Bennett and Bernreuter Systems of Scoring Bernreuter Inventory. M. Ed. thesis, 1949.



COEFFICIENTS OF CORRELATION BETWEEN THE PERCENTILE SCORES  
OBTAINED BY THE TWO METHODS

Sub-group	N	B1-N	B2-S	B3-I	B4-D	All Traits
College Men	40	.96	.95	.95	.88	.93
College Women	50	.96	.89	.88	.89	.90
Adult Women	50	.96	.93	.92	.92	.92
Adult Men	50	.98	.92	.97	.89	.90
All Groups	190	.96	.92	.93	.90	
Total Group	760					.91

From the various statistical analyses of these results Mr. Kostash concludes that:

- (a) the obtained correlations are significantly greater than zero
- (b) with an obtained  $r = 0.90$  for a population of 50 the parameter values of  $r$  are .80 and .95, and
- (c) that no statistically significant differences exist within the Table.

Thus, as an illustration, we may take the value of  $r = 0.905$  for college men on B2-S with a population as low as 35. The limiting values of  $r_h$  are .78 and .96. We may therefore be confident at the 1 per cent level that the true  $r$  lies somewhere within these limits<sup>1</sup>.

---

1. Lindquist, E. F.: Statistical Analyses in Educational Research. Table 14, page 215.



With higher values of  $r$  and larger populations the limiting values converge sharply. Thus, with  $r = .933$  for a population of 65 the limiting values at the 1 per cent level are .964 and .874.

The conclusion to be derived from the foregoing tables is that the Bennett simplified method of scoring yields measures with a high degree of co-variance for all four categories of population. Taking into account the subjective nature of the inventory itself and the variability of response, it appears that for all practical purposes the methods of scoring under review may be used interchangeably.





CHAPTER V  
SUMMARY AND CONCLUSIONS

A high degree of comparability of two methods of scoring the Bernreuter Personality Inventory has been established.

Reliably high coefficients of correlation, ranging from .836 to .994, were obtained.

In 1935 Bennett reported similar results based upon test scores for a small population of adult women.

In 1949 Kostash, from a study parallel to the present investigation, reported his findings based upon a total population of 190.

Table II presents for comparative purposes a summary of the finds in the three studies. The data shown here are composite as to population but broked down as to factor.

TABLE II

	Kostash	Macneil	Bennett
B1-N	0.96	0.932	0.951
B2-S	0.92	0.911	0.893
B3-I	0.93	0.933	0.934
B4-D	0.90	0.909	0.924

Differences between r's for the same factor have proven statistically non-significant.



From the foregoing summary of findings the following conclusions may be drawn:

- (a) The Bernreuter and Bennett systems of scoring are essentially equivalent.
- (b) In the interests of economy of time and effort, the Bennett simplified scoring method may be used in preference to the Bernreuter.
- (c) The basic equivalence of the two methods applies indiscriminately to the four factors in the Bernreuter profile and to the four categories of population represented in this study.



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Diagnostic Psychological Testing - Rapaport  
Psychological Abstracts -  
Stanford University Pamphlets on Bennett's  
Short Scoring Method.



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- Sample 1b- Segment of Bernreuter Percentile Norms,  
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- Sample 11- Report Form, Case 47, Adult Women.





Sample 1a - Percentile ratings of College Men,  
Case 35, as deduced from the Bernreuter tables.

	B1-N	B2-S	B3-I	B4-D	F1-C	F2-S
Plus	75	109	48	139	-	-
Minus	194	113	139	85	-	-
Difference	-119	-4	-91	54	-	-
Percent	24	27	8	55	-	-

Sample 1b - Showing segment of Bernreuter  
Percentile Norms. Sufficient of tables is shown to  
cover College Men, Case 35.

Raw Score	B1-N	B2-S	B3-I	B4-D
55	91	71	93	55
50	90	68	92	52
45	89	64	91	49
40	88	61	90	46
(part of table omitted)				
5	77	35	73	28
0	76	31	70	25
-5	74	27	67	22
-10	72	24	64	19
-15	70	21	61	17
-20	69	18	57	15
-25	68	16	53	13
(part of table omitted)				
-70	50	3	21	5
-75	48	3	17	4
-80	45	2	14	4
-85	42	2	11	3
-90	39	1	8	3
-95	36	0	6	3
-100	34	0	4	2
-105	31	0	3	2
-110	29	0	2	1
-115	26	0	1	1
-120	24	0	1	1



Sample 2 - Last five questions on the Personality inventory, showing how to mark the answers. Following are given the answers of College Men, Case 35 to these questions.

Facsimile of the last five questions on Bernreuter's Inventory, as answered by College Men, Case 35.

121. ☒ Yes No ? Do you like to be with people a great deal?

122. ☒ Yes No ? Can you be optimistic when others around you are greatly depressed?

123. ☒ Yes No ? Does discipline make you discontented?

124. Yes ☒ No ? Are you usually considered to be indifferent to the opposite sex?

125. Yes ☒ No ? Would you feel very self-conscious if you had to volunteer an idea to start a discussion among a group of people?

Sample 3 - Equations used by Bennett to show the relationship existing between his F-Scales and the original Bernreuter B-Scales:

B1-N	4.120F1-C	1.083F2-S	-	338.553
B2-S	-1.917F1-C	2.831F2-S	-	69.127
B3-I	2.269F1-C	0.873F2-S	-	210.362
B4-D	-3.034F1-C	0.917F2-S	-	119.462



Sample 4 - This shows segment of the score chart for College Men. Enough of the table is given to give the readings of Percentiles for Case 35, in the four traits - B1-N, B2-S, B3-I and B4-D. Scores for Case 35 are enclosed in a red rectangle.

Score Chart Segment

F2-S Sc. (Bennett)

49	B1-N	1	1	1	1	1	2	5	8	14	20
	B2-S	76	71	66	61	55	50	44	37	33	26
	B3-I	1	1	1	1	1	1	2	4	8	13
47	B4-D	97	96	94	88	84	78	73	65	58	51
46	B1-N	1	1	1	1	1	1	4	8	12	19
	B2-S	70	66	60	54	49	43	37	32	26	21
	B3-I	1	1	1	1	1	1	2	3	6	11
44	B4-D	97	96	92	87	82	77	71	64	57	49
43	B1-N	1	1	1	1	1	1	4	7	11	17
	B2-S	65	59	54	48	42	37	31	25	21	17
	B3-I	1	1	1	1	1	1	1	3	5	10
41	B4-D	97	95	91	86	81	75	69	62	55	48
40	B1-N	1	1	1	1	1	1	3	6	10	16
	B2-S	59	53	48	41	36	30	25	20	16	13
	B3-I	1	1	1	1	1	1	1	2	4	8
38	B4-D	97	94	90	85	80	74	68	60	53	46
F1-C		4	8	12	16	20	24	28	32	36	40
Scores											38
(Bennett)		1	5	9	13	17	21	25	29	33	37



Sample 5 - This shows the score of College Men, Case 35. All "Yes", "No" and "?" that were visible through the windows of Fl-C score chart are shown; those circled by Case 35 have been circled. The weighted value of each answer is shown to the right of the aperture. Total - 38.

Bennett Scoring Chart Fl-C

				39	Yes		84		
				40			85		
				41			86	Yes	1
				42	Yes	2	87	Yes	1 No
				43		No	88	Yes	1
				44			89		
				45			90		
1	Yes	1	No	46	Yes		91	Yes	?
2	Yes			47	Yes		92		
3		No		48	Yes	1	93	Yes	
4	Yes			49	Yes		94		No
5		No	?	50	Yes	1	95		?
6				51	Yes		96	Yes	?
7	Yes			52			97		
8	Yes			53	Yes		98		
9	Yes	1		54	Yes		99		
10	Yes		?	55			100		
11	Yes	No		56		No	101		
12	Yes		?	57	Yes		102		
13				58		No	103	Yes	?
14	Yes		?	59	Yes	2	104	Yes	
15				60			105		
16			?	61	Yes	No	106	Yes	?
17	Yes		?	62		No	107		
18	Yes			63	Yes		108		No
19				64	Yes		109		
20	Yes			65	Yes		110		No
21	Yes	1		66	Yes		111	No	1
22	Yes	1	?	67			112	No	
23				68			113	Yes	?
24	Yes	2	?	69	Yes	3	114	Yes	?
25				70	Yes		115	Yes	
26	Yes		?	71	Yes		116	Yes	
27	Yes		?	72	Yes	2	117		
28		No	1	73	Yes		118	Yes	?
29				74			119	Yes	;
30	Yes			75		No	120		
31				76	Yes	No	121		
32	Yes		?	77	Yes		122		
33				78	Yes	2 No	123	Yes	1
34		No	1	79			124	Yes	?
35			?	80	Yes		125	Yes	?
36				81	Yes				
37	Yes		?	82		No			
38	Yes	1	?	83	Yes	1			





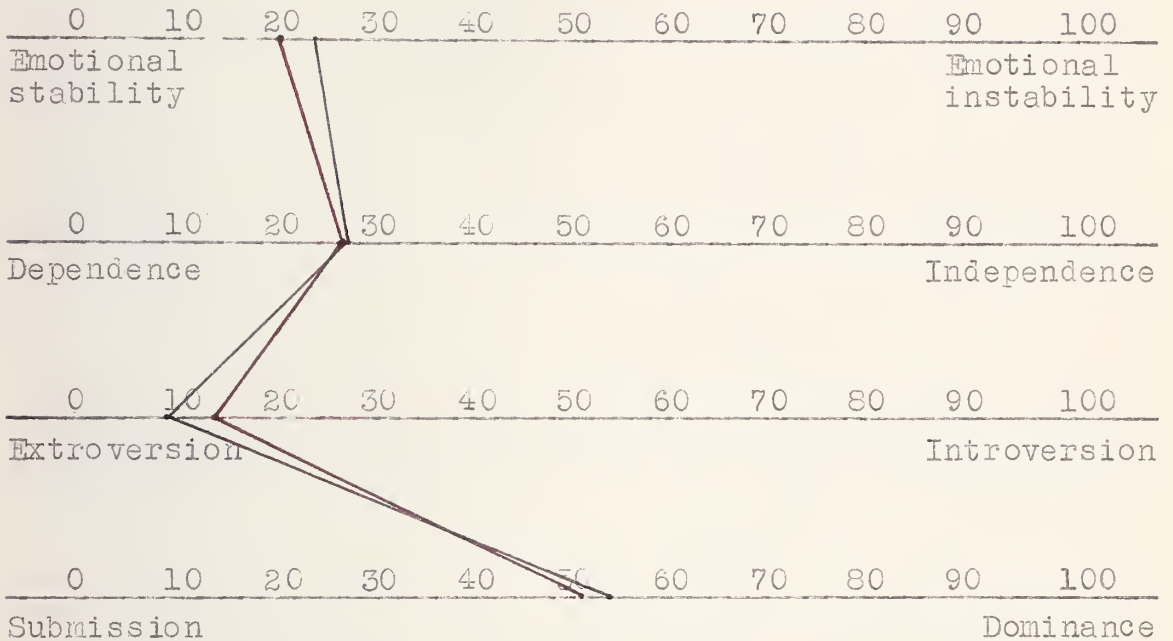
Sample 6. Facsimile of the tabulation on the front page of Personality Inventory, College Men, Case 35.

Percentiles marked (a) are those obtained from the Bernreuter raw scores; percentiles marked (b) were obtained by using Bennett F-scales and chart of which segment is shown in sample 4. The numbers at the top right above the tabulation are the Bennett raw scores F1-C and F2-S.

					38	49
	B1-N	B2-S	B3-I	B4-D	F1-C	F2-S
Plus	75	109	48	139	-	-
Minus	194	113	139	85	-	-
Difference	-119	-4	-91	54	-	-
Percentile (a)	24	27	8	55	-	-
Percentile (b)	20	26	13	51	-	-



Sample 7. College Men, Case 35. Graphical representation of traits where the scores are fairly close.



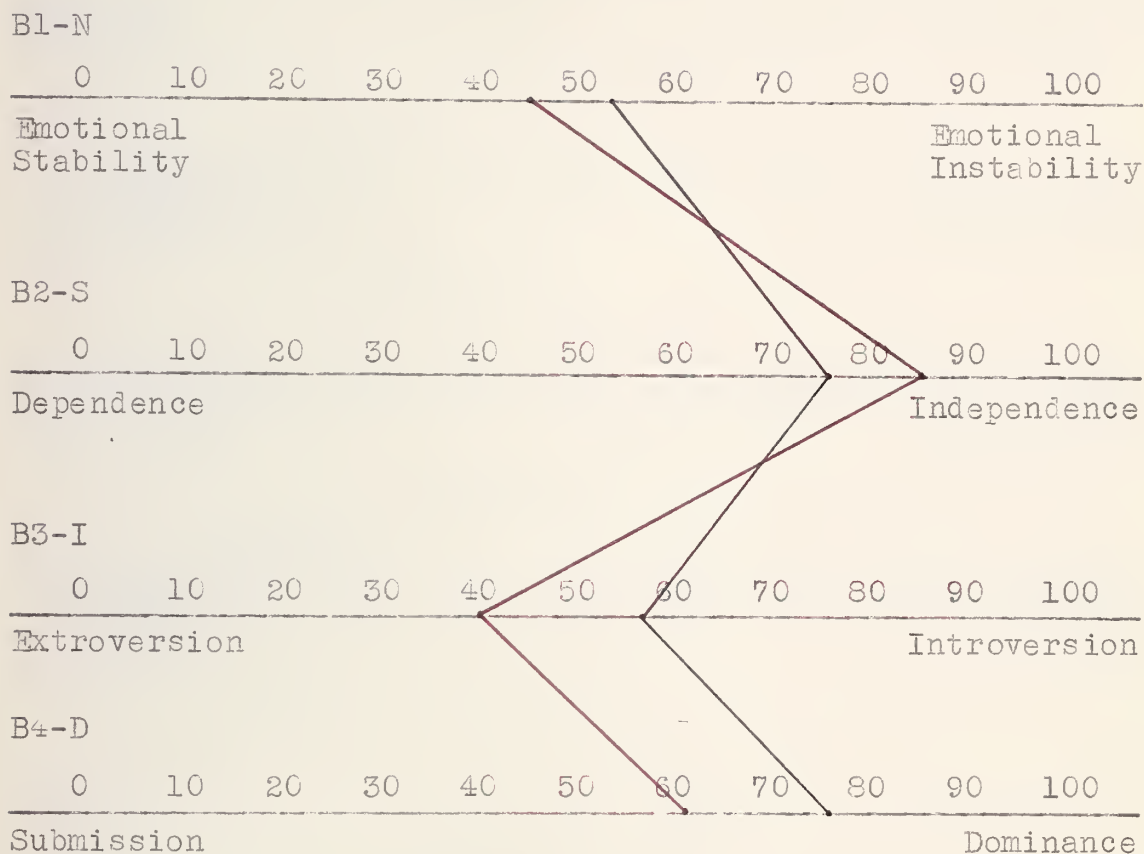
Blue Line . . . . . Bernreuter

Red Line . . . . . Bennett Scores

Scoring Method	Percentile Ratings				Case 35
	B1-N	B2-S	B3-I	B4-D	
Bernreuter	24	27	8	55	
Bennett	20	26	13	51	



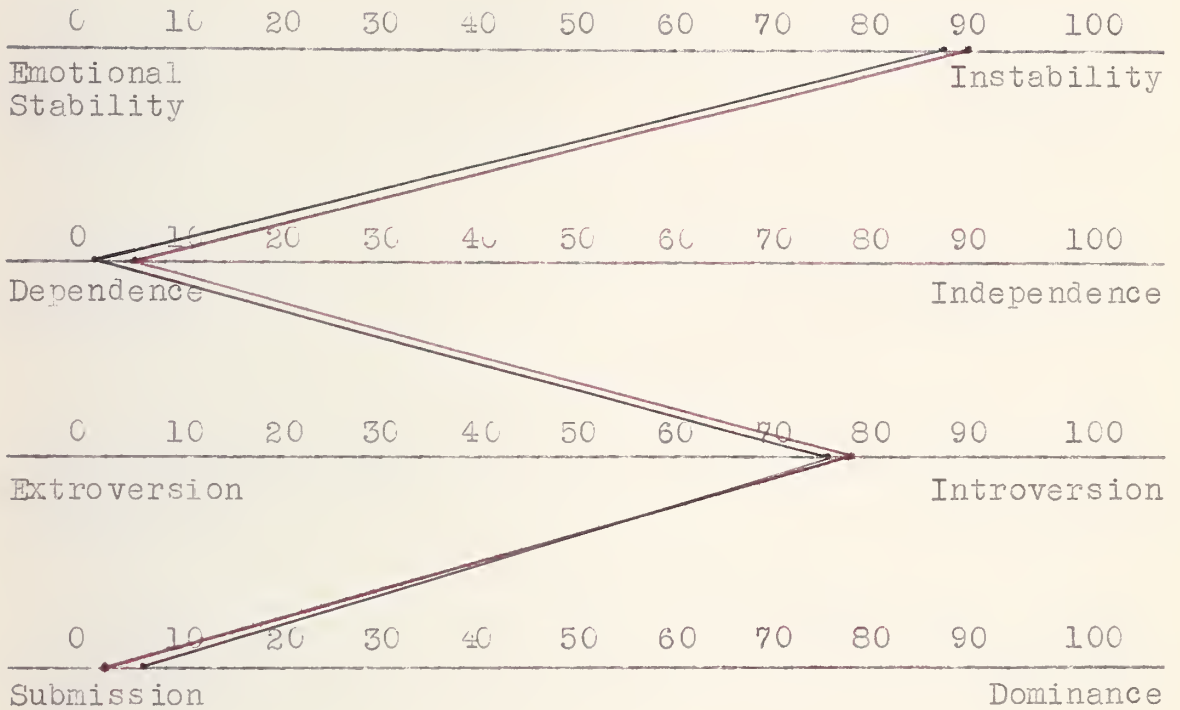
Sample 8. College Men, Case 28. Graphical representation of traits where scores show considerable disparity.



Scoring Method	Percentile Ratings				Case 28			
	B1-N	B2-S	B3-I	B4-D	B1-N	B2-S	B3-I	B4-D
Bernreuter	54	77	58	75	54	77	58	75
Bennett	46	85	40	62	46	85	40	62



Sample 9. Report Form, College Women, Case 25.



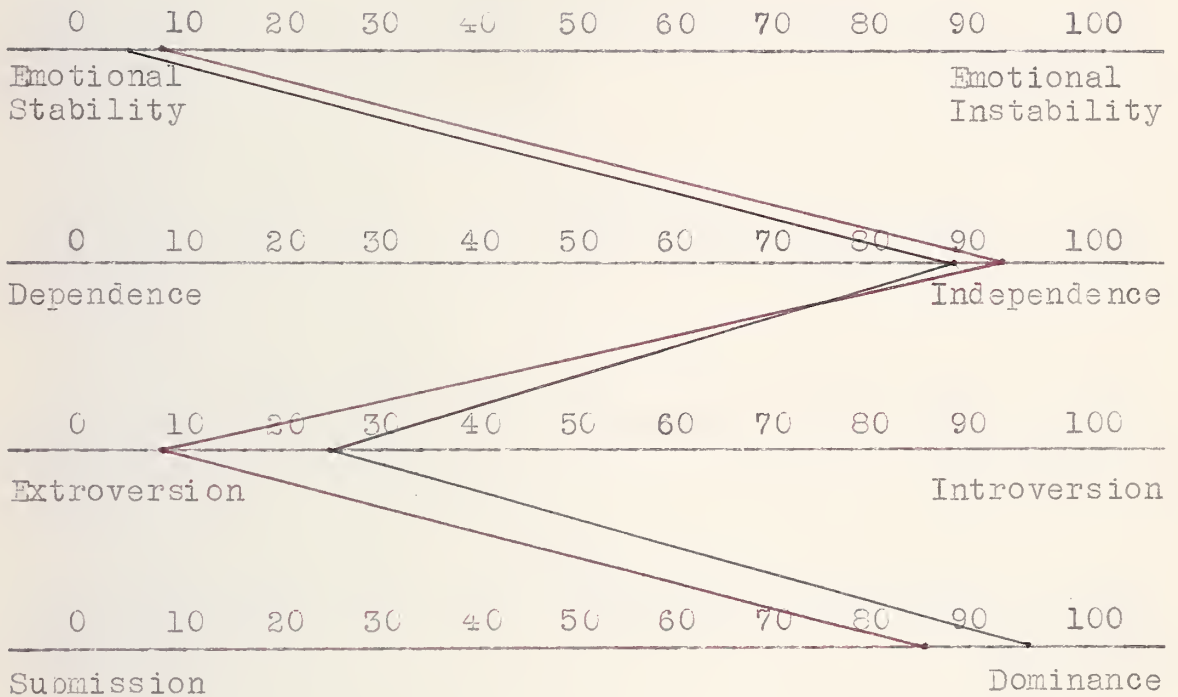
Percentile Scores

Scoring Method	B1-N	B2-S	B3-I	B4-D
Bernreuter	88	1	76	8
Bennett	90	6	78	4





Sample 1C. Report Form of Case 31, Adult Men.

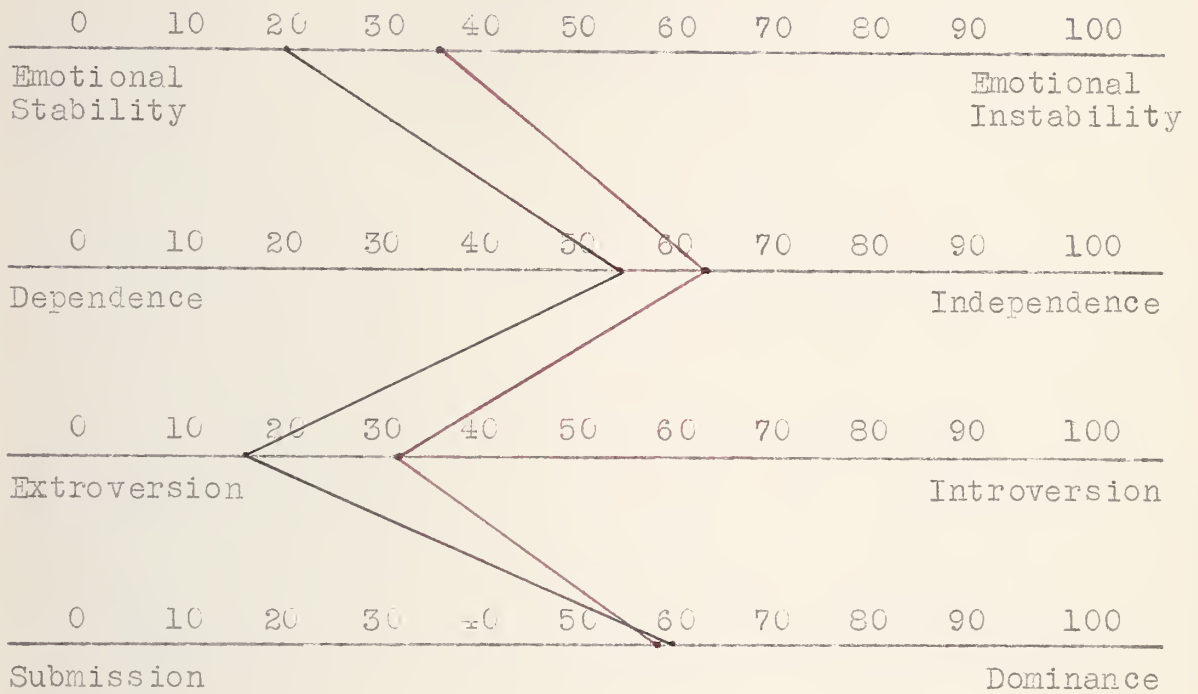


Percentile Scores

Scoring Method	B1-N	B2-S	B3-I	B4-D
Bernreuter	5	86	26	97
Bennett	9	94	9	87



Sample 11. Report Form, Case 47, Adult Women.



Percentile Scores

Scoring Method	B1-N	B2-S	B3-I	B4-D
Bernreuter	21	53	17	59
Bennett	37	63	33	58





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